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TECHNICAL REPORT CR-RD-SS-87-14

FEASIL USER'S GUIDE VERSION 7.4.1

Bruce E. Tucker  
The University of Alabama in Huntsville  
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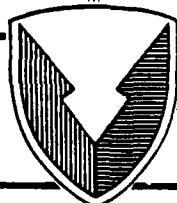
AD-A196 299

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Prepared for:  
Systems Simulation and Development Directorate  
Research, Development, and Engineering Center

Contract No. DAAH01-87-D-0021



**U.S. ARMY MISSILE COMMAND**

*Redstone Arsenal, Alabama* 35898-5000

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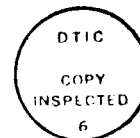
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Distribution Statement	
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AD-A196 299

REPORT DOCUMENTATION PAGE				Form Approved OMB No 0704-0188 Exp Date Jun 30, 1986	
1a REPORT SECURITY CLASSIFICATION <b>UNCLASSIFIED</b>			1b RESTRICTIVE MARKINGS		
2a SECURITY CLASSIFICATION AUTHORITY			3 DISTRIBUTION / AVAILABILITY OF REPORT		
2b DECLASSIFICATION / DOWNGRADING SCHEDULE			Approved for public release; distribution is unlimited.		
4 PERFORMING ORGANIZATION REPORT NUMBER(S)  5-31625			5. MONITORING ORGANIZATION REPORT NUMBER(S)  CR-RD-SS-87-14		
6a. NAME OF PERFORMING ORGANIZATION  Resident Research Office		6b. OFFICE SYMBOL (if applicable)	7a. NAME OF MONITORING ORGANIZATION Systems Simulation and Development Directorate, Res, Dev, and Engr Ctr		
6c. ADDRESS (City, State, and ZIP Code) The University of Alabama in Huntsville Research Institute, Room E-47 Huntsville, AL 35899		7b. ADDRESS (City, State, and ZIP Code) Command, U.S. Army Missile Command ATTN: AMSMI-RD-SS-SE Redstone Arsenal, AL 35898-5252			
8a. NAME OF FUNDING / SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (if applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c. ADDRESS (City, State, and ZIP Code)		10. SOURCE OF FUNDING NUMBERS			
		PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification)  FEASIL User's Guide - Version 7.4.1 (Unclassified)					
12. PERSONAL AUTHOR(S) Bruce E. Tucker					
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM 87/01 TO 87/05		14. DATE OF REPORT (Year, Month, Day) November 1987	
15. PAGE COUNT 101					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
			RDBMS Database Management		
			FEASIL DBMS		
19. ABSTRACT (Continue on reverse if necessary and identify by block number)  FEASIL (Fortran Engineering and Scientific Inquiry Language) version 7.4.1 is documented in this user's guide. This user's guide is designed for users at all levels, but is primarily directed at the beginning and intermediate user. The appendices provide exhaustive examples of this relational database management software in use.					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21 ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL Dr. M. M. Hallum III			22b TELEPHONE (Include Area Code) (205) 876-4141		22c OFFICE SYMBOL AMSMI-RD-SS-SE

## Preface

This technical report was prepared by the Resident Research Office of the University of Alabama in Huntsville. The work documented in this report was performed by Bruce E. Tucker. The purpose of this report is to serve as a user's guide to FEASIL (Fortran Engineering and Scientific Inquiry Language), a Relational Database Management System (RDBMS). This report is to serve as documentation of technical work performed under delivery order 007, contract number DAAH01-D-0021. Mr. Terry Long was principal investigator; Dr. M. M. Hallum, III, Chief, Systems Evaluation Branch of the U.S. Army Missile Laboratory, U.S. Army Missile Command, was technical monitor.

The technical viewpoints, opinions, and conclusions expressed in this document are those of the author and do not necessarily express or imply policies or positions of the U.S. Army Missile Command.

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## 1.0 INTRODUCTION

This report is designed to serve as a user's guide to FEASIL (Fortran Engineering and Scientific Inquiry Language). FEASIL is a relational database management system (RDBMS), created by Dr. M.M. Hallum, which is used by the Systems Evaluation Branch of the System Simulation and Evaluation Directorate. This user's guide is designed to be a learning and reference tool for users at all levels.

### 1.1 DEFINITION OF TERMS

Before the operation of FEASIL is discussed, it is important to understand some of the associated terms. With this in mind, a brief discussion of some of these terms is provided.

Account - In the context of this report, "account" will be used interchangeably with "directory".

Active - A condition where a relation or entry in a relation is active in memory. If an entry is "active" then it is in memory.

ASCII - American Standard Code for Information Interchange - a standard system for representing alpha-numeric characters in computer memory and storage. An ASCII file is one which contains no special control characters, only standard letters, numbers, and symbols, stored in standard ASCII code.

Case Sensitive - An environment where lower case characters are not equivalent to upper case characters. FEASIL is case sensitive. The user must respond to all menus with either numerals or upper case letters.

Database - Any organized collection of data. In the context of this report, a database is equivalent to a relation.

DEC - Digital Equipment Corporation - a leading computer manufacturer. The VAX line of computers is one of their more popular products.

Directory - A software structure within a computer storage media. Each user has a directory, or account, on the VAX computer. This directory defines the user's privileges and restrictions, as well as which disk drive will be used to store their files.

Hollerith - A method of storing alpha-numeric characters in computer memory and storage. FEASIL stores much of its data in Hollerith format.

Integer - A whole number. A number which does not contain a decimal point. Examples: 0, 1, -10, 100

Interactive - A computer operating mode where a user either submits data or responds to a request, while a program is running, usually through a terminal. Batch is an alternate mode of operation where all data is supplied to a program before that program is actually executed.

Pointer - A dynamic variable which "points" at a certain piece of data. The tuple pointer "points" to the current record.

RDBMS - Relational Database Management System - Software used to store and manipulate data, where the data may be represented in tabular form (columns and rows). FEASIL is a RDBMS.

Real Number - A number which contains a decimal point. Examples: 1.00, 2.25, -10.5

Record - In the context of this report, an entry in a relation. Record, tuple, and entry are used interchangeably.

Relation - A database constructed in tabular form. The rows (tuples) in the relation represent entries in the relation. The columns represent various data fields which contain some value for each entry.

Strategy - A description of the type of data that will be stored in a column. Every column in a FEASIL relation must have either (1) integer, (2) decimal, (3) single character, or (4) character string strategy.

String - A sequence of characters stored as one unit.

Tuple - A row, or entry, in a table. For FEASIL this means an entry in a relation.

Union - In the context of this report, an operation which combines unique members of two sets, equivalent to a Boolean Algebra OR operation.

User - In the context of this report, a person who uses FEASIL.

VAX - A popular line of computers, manufactured by DEC. The VAX operated by Systems Evaluation is a model 11-780.

Volume - A computer storage device, such as a disk. For almost all cases, the system default volume is the correct choice. At any FEASIL prompt for volume label, the user should, in general, press RETURN.



## 1.2 PURPOSE OF FEASIL

Systems Evaluation and its contractors produce and analyze large amounts of data. This data may be the result of engineering tests, simulations, or data kept regarding inventory or personnel. No matter what the source of the data actually is, there is frequently a need to record, organize, or manipulate it. This is the purpose of FEASIL. FEASIL is a relational database management system which may be used to store, organize, or manipulate data.

## 1.3 HISTORY OF FEASIL

FEASIL was originated in July 1979, by Dr. M.M. Hallum, as a dissertation for Southeastern Institute of Technology, Huntsville, Alabama. It was programmed in FLECS, a FORTRAN-6 precompiler, on an Interdata 8/32. FEASIL evolved through several revisions, resulting in version 6.0.

In September of 1983, the University of Alabama in Huntsville (UAH) completed a task which converted FEASIL to run under FORTRAN 77 (Perkin-Elmer FORTRAN 7), using the FLECS precompiler. During this conversion, FEASIL was optimized and significant changes were made to the way data was stored. These changes resulted in version 7.0. Because of these changes, FEASIL data stored under version 6 was incompatible with the new version 7.0. At that time, all version 6 data was converted to version 7 using another program.

During 1985, the University of Alabama in Huntsville was contracted to transport FEASIL from the Interdata 8/32 (Perkin-Elmer) to the new DEC VAX 11-780 recently purchased by Systems Evaluation. These changes resulted in FEASIL version 7.1. Because the Interdata 8/32 and the VAX 11-780 are very poorly compatible machines, an external program was used to convert FEASIL data files from the Perkin-Elmer to the VAX.

Since the conversion to the VAX in 1985, there have been several minor revisions which have resulted in FEASIL version 7.1.4. All FEASIL data created since the move to the VAX in 1985 is 100% compatible. Today FEASIL version 7.1.4 is resident on the Systems Evaluation VAX 11-780, located in building 5400 on Redstone Arsenal, Alabama.

## 2.0 HOW TO ACCESS FEASIL

FEASIL is resident on the Systems Evaluation VAX 11-780. In order to access FEASIL, the user must first meet the necessary requirements to use the VAX. Any questions regarding these requirements should be directed to the system manager. Once these requirements are met, the user must "log in." This is accomplished by entering a username (account name) and a password. After the user has successfully "logged in", the command FEASIL should be entered. The FEASIL main menu should then appear.

An example of this entry procedure is shown below in Figure 1. Note that in this case the username is TUCKER. The password does not appear on the screen.

```
Username: TUCKER
Password:

TUCKER: FEASIL
  USERDISK1:[TUCKER]

-----
Vax Feasil 7.1.4 February 1987
-----

1 = [Q]uit
2 = [C]reate a new relation
3 = [D]elete a relation
4 = [E]dit a relation
5 = [MO]dify column specifications
6 = [ME]rge two relations
7 = [REO]rganize a relation
8 = [RET]rieve, manipulate, or plot data
9 = [B]ackup a relation to tape
10 = [H]elp
11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)
or corresponding integer
```

**Figure 1**  
Entry into FEASIL

Typing FEASIL runs a command file in a system level directory. A copy of this command file is included in Appendix A. One of the first things that this command file does is show the user their current default directory. In the example shown in Figure 1, the default directory is USERDISK1:[TUCKER]. Any relations created or manipulated by the user will be placed in this directory.

### 3.0 COMMAND SUMMARY

The following eleven sections provide a detailed description of each command. Correspondingly, appendices B - M provide actual examples of each FEASIL command in operation. These examples are exact images of what the user sees on the screen. Included with these examples are narrative explanations of the process. These explanations are enclosed within boxes and do not appear on the user's display. They are included only as in-line explanations.

Every command and every option have been exhaustively exercised in Appendices B - M. These appendices correspond to Sections 3.1 - 3.11 of this report. Additionally, in Section 7.0, an index to these appendices is provided. This index is designed so that the user may easily look up an example of a specific operation in progress, without having to search the entire appendix.

#### 3.1 Quit

The QUIT option is used to exit FEASIL. After entering the [Q]uit command, the command file (Appendix A) will show the user their default directory. Then, the command file will ask the user if they wish to purge their account. Purge is a VAX VMS command which will delete obsolete files, leaving only the latest copy of each file in the default directory. It is a good practice to answer YES to this question every time you exit FEASIL. This will help prevent the user from occupying excessive disk space. Finally, the command file will ask the user if they wish to see their disk quota. The disk quota is a parameter of the user's VAX account, defined by the system manager, which limits the amount of disk space that a user may occupy. Answering YES to this question simply shows the user how much of their allocated space they are using and how much is still available. The answer to this question does not affect the user's account in any way.

An example of the QUIT option and the subsequent questions is included in Appendix B.

### 3.2 Create a New Relation

The CREATE option is the first action taken in the development of a database. The [C]reate option sets up a relation according to the user's specifications.

When creating a relation the user must first supply a relation name. The relation name may be any combination of up to 42 characters (letters or numbers). The only restrictions are that the first character of the relation name must be a letter, not a number or symbol, and that the relation name must be unique. Two relations may not have the same name within the same account.

Once the relation name has been entered, the user must then completely describe the relation. The first description will be the number of columns. Although it is possible to have dozens of columns, most relations have only a few. It is usually less confusing to have several smaller relations, rather than one large one. Next, each column must be provided with a name and strategy. A column name may be any combination of up to 64 characters. Length is the only restriction on column names.

After each column has been properly described, the user is given the opportunity to correct mistakes. If any mistakes were made in the column description, answer YES at the prompt, otherwise answer NO.

Appendix C provides an example of creating a relation. In this example, a relation named SAMPLE, which has four columns, is created.

### 3.3 Delete a Relation

When there is no further need for a relation, it should be deleted, or erased, from the system. The DELETE option is used to permanently erase a relation. Once the [D]elete option has been selected, the user must then confirm the deletion. This confirmation acts as a "failsafe" in case the DELETE option is accidentally pressed.

An example of deleting a relation is provided in Appendix D. In this example a relation named SAMPLE is deleted.

### 3.4 Edit a Relation

The EDIT command is used to add, change, or remove data from a relation. Usually, most of a FEASIL user's time is spent using the EDIT utility. Examples of EDIT in operation are provided in Appendix E and Appendix F.

After selecting the [E]dit command, the user must first specify the relation name. Most users should press RETURN at the prompt for volume label. If the relation name is entered incorrectly, or if the relation does not exist FEASIL will respond with << FILE NOT FOUND.>>

Once the correct relation name has been entered, FEASIL will provide some basic information about the relation. This information consists of (1) the number of records (entries) in the relation, (2) the number of columns in the relation, (3) the current record number, and (4) the current column number. The current record number may be changed by using the plus (+) and minus (-) commands. This tells the user "where" he is located within the relation. The current column number may be changed using the [E]xamine command or the [F]ind command. These options will be discussed in more detail later in this section.

The user is then prompted with three questions. The first question asks if the column names are to be displayed during editing. Usually, the answer to this question is YES. The second question asks how many columns are to be displayed. The user may display from 1 to all the column names, depending on the preference of the user. The third question asks for the order in which the column names are to be displayed. Usually, the answer to this question is YES for default order. This will display the columns in the order they were created. If the user desires some other order, he should answer NO, then specify the desired order. After these questions have been answered, the Edit command: prompt should appear. The user is now ready to begin editing.

After a relation has been created, the EDIT command is used to insert data, or entries, into the relation, using the [I]nsert command. Although editing an empty relation is no different from editing a relation which contains lots of data, an example of this special case is provided in Appendix E. A relation called SAMPLE, which has 4 columns but no entries, is to be edited.

The following sections provide a detailed description of each edit command. It will be assumed, for the rest of this sub-section, that the user has already entered the edit option, and has accessed a relation.

#### 3.4.1 Columns Command

The [C]olumns command provides the user with a list of the names of the columns in the relation being edited. The columns command does not change a relation or the data in the relation in any way. An example of this command is included in Appendix F on page F-3.

#### 3.4.2 Print Command

The [P]rint command prints tuple data to the screen. Data from all the columns currently being displayed will be shown on the user's screen. If the print is appended with an integer the print command will be repeated the number of times specified. For example, if the user typed the command [P5], five tuples, starting with the current tuple would be printed to the screen. An example of this command is included in Appendix F on page F-3.

#### 3.4.3 Restart Command

The [R]estart command is used to change the editing setup. With this command, the user may alter the number of columns that are being displayed, the display of column names, or the order in which columns are being displayed. These are the same three questions which appear during the original edit startup. An example of this command is included in Appendix F on page F-4.

#### 3.4.4 Plus (+) Command

The [+], or plus command, is used to advance through a relation. When the user selects the plus command, FEASIL will advance the tuple pointer, and display the next entry in the relation. If the plus command is appended with an integer, the command will be repeated the number of times specified. For example, if the user types the command [+5], FEASIL would advance 5 entries forward. The plus command can be used to move quickly to the bottom of the relation. Simply append the total number of entries to the [+]. An example of the plus command is included in Appendix F on page F-4.

If the user has reached the bottom of the relation and presses the plus command again, the last entry will be displayed again. There is no "wrap around" function.

#### 3.4.5 Minus (-) Command

The [-], or minus command, is used to move backwards through a relation. When the user selects the minus command, FEASIL will move the tuple pointer backwards, then display the next entry in the relation. If the minus command is appended with an integer, the command will be repeated the number of times specified. For example, if the user types the command [-5], FEASIL would move 5 entries backward. The minus command can be used to move quickly to the top of the relation. Simply append the total number of entries to the [-]. An example of the minus command is included in Appendix F on page F-6.

If the user has reached the top of the relation and presses the minus command again, the first entry will be displayed again. There is no "wrap around" function.

#### 3.4.6 Find Command

The [F]ind command is used to locate a particular value or string in a specified column. After selecting the [F]ind command, the user must specify the column in which to search and what value is to be searched for.

FEASIL will begin its search with the current entry and work towards the bottom of the relation. If the particular value or string is not found in the part of the relation below the current entry, the search will continue from the top of the relation. If the particular value or string is still not located, FEASIL will respond with <<STRING NOT FOUND>>. If the value is found, FEASIL will report its location then display that entry.

Using the find command is one way to set the current column number, and to move the tuple pointer to the desired entry. This may be observed by using the [?] command before and then again after the find command is used. An example of the find command is included in Appendix F on page F-5.

#### 3.4.7 Substitute Command

The [S]ubstitute command is used to change the data in a particular column, for a particular entry. The substitute command will change the data in the current column number (set by either Find or Examine), for the current record (entry) number (set by Plus, Minus, or Find). If the user wishes to change the value in a particular column, the current column number must first be set to the correct number using the Find or Examine command, otherwise the default is column 1.

Once the [S]ubstitute command has been selected, a new value must be entered. If the new value is to be blank, simply press RETURN at the prompt. An example of the substitute command is included in Appendix F on page F-5 and F-6.

#### 3.4.8 Examine Command

The [E]xamine command is used to view the data in a specific column and to set the current column pointer. Often, the examine command is used as a prelude to the substitute command. The examine command does not change the data in a column, just "sets the stage" for Substitute. The examine command is used when the user has already located an entry using Find, Plus (+), or Minus (-) (therefore positioning the tuple pointer on that entry), then wishes to set the column pointer to a particular column. An example of the [E]xamine command is included in Appendix F on page F-6.

#### 3.4.9 Delete Command

The [D]elete command is used to permanently remove one or more entries from a relation. The delete command **MUST** be appended by an integer. This integer specifies the number of entries that will be deleted, starting with the current tuple.

To delete an entry from a relation, use the plus and minus commands to position the current tuple pointer to the desired entry. Then, enter the [D1] command. This will delete only the current tuple. If the user had desired to delete the current entry and the three below it, the command [D4] would have been used.

An example of the delete command is included in Appendix F on page F-6.

#### 3.4.10 Insert Command

The [I]nsert command is used to make a new entry in a relation. The new entry will be inserted below the current entry. If the user is at the bottom of the relation, the new entry is appended to the bottom. After the user has selected the [I]nsert command, FEASIL will prompt for data for each column. The user may either enter a value or press RETURN to enter an "empty" value. An example of the insert command is included in Appendix E on page E-2.

#### 3.4.11 Bottom Command

The [B]ottom command is used to make a new entry at the bottom of the relation. The bottom command works just like the [I]nsert command does at the bottom of a relation. After the user has selected the [B]ottom command, FEASIL will prompt for data for each column. The user may either enter a value or press RETURN to enter an "empty" value. An example of the bottom command is included in Appendix F on page F-6.

#### 3.4.12 Output Command

The [O]utput command is used to save a specified number of entries to a file. The output command would be used to send data to a file, which may be used by another program. If the output command is appended with an integer, the command will be repeated the number of times specified. For example, if the user types the command [O5], FEASIL would copy 5 entries, starting with the current entry, to a file. After the user has selected the output command, the user must specify the name of the destination file, and a delimiter (marker symbol) between data elements. An example of the output command is included in Appendix F on page F-7.



#### 3.4.13 Add command

The [A]dd command is used to add a specified number of entries to a relation from an external file. This is the complement of the output command described in section 3.4.12. The file which will be read by the add command must be structured so that the data in it will "match" the relation description. A single character delimiter must be included in this file so that the add command may distinguish one column from another.

After the user has selected the add command, the user must specify the number of records to be added. Note, if the add command was accidentally chosen, enter 0 (zero) for the number of records to cancel the operation. Once the number of records has been specified, the user must supply the name of the file where data is to come from, and the single character delimiter which separates the columns. FEASIL will then execute the command and report the results upon completion. An example of the add command is included in Appendix F on page F-7.

#### 3.4.14 Help Command

The edit help facility is, like all command level help, accessed by pressing H. The [H]elp command provides a list and description of the valid edit commands. An example of the help command is included in Appendix F on page F-3.

#### 3.4.15. ? Relation Information Help

The [?] command provides the user with information about the current editing status. The [?] command provides the user with the relation name, number of entries, number of columns, the current entry, and the current column. An example of the [?] command is included in Appendix F on page F-8.

#### 3.4.16 Quit Command

The [Q]uit command is used to leave the edit utility and return to the main FEASIL menu. An example of the [Q]uit command is included in Appendix F on page F-8.

### 3.5 Modify Column Specifications

The MODIFY column specifications option is used to change the description of an existing relation. The MODIFY option may be used to (1) rename an existing column, (2) delete an existing column, (3) add a new column, or (4) list the present column names.

The MODIFY option changes the relation itself, not the data within it. The user may not change the strategy of an existing column. If this type of manipulation is needed, it is necessary to add a new column with the desired strategy, transfer the data, then delete the old column. Modifications of this type may require large amounts of the user's time and should be avoided whenever possible. Much time may be saved by carefully planning a relation before it is created.

An example of the MODIFY option is included in Appendix G.

### 3.6 Merge Two Relations

The MERGE option is used to produce a new relation from two existing input relations. There are two main types of merging operations. Using these two operations, the user may either expand a relation "column-wise" or "row-wise", depending upon the need.

The first of these two joining operations, the merge utility, acts as a "union" operator. The output from the merge utility is a relation whose columns consist of the total number of unique columns, in the either of two input relations. If a specific column name exists in one or both relations, a corresponding column will be created in the output relation. The entries, or rows, in the output relation will consist of the intersecting entries in the two input relations. The entries will be those which intersect one-to-one within those columns whose names intersect one-to-one.

It is helpful to notice when using the merge utility, that the total number of entries in the output relation will always be less than (or equal to) the number of entries in the smaller of the two input relations. Also, the total number of columns in the output relation will always be at least the number of columns in the largest (column-wise) input relation and may not exceed the total number of columns in both input relations.

The second joining operation, the add utility, acts as an "appending" operator. The output from the add utility is simply the sum of the two input relations. In order to use the add utility, the description of the two input relations must be identical. The number of columns, as well as the column names and strategies, must exactly match.

Appendix H provides an example of the MERGE option in use. In this example both types of joining operations are shown. First, a relation called SAMPLE is "added" to a relation called SECOND RELATION to produce an output relation called OUTPUT FROM AN ADD. Second, a relation called SAMPLE is "merged" with a relation called SECOND SAMPLE to produce the output relation OUTPUT FROM A MERGE.

### 3.7 Reorganize a Relation

The REORGANIZE option is used to improve the storage efficiency of a relation. A relation may need to be reorganized after the MODIFY column specifications option has been used, or after several entries have been deleted during an editing session. An empty relation may not be reorganized. A well organized relation takes up less disk space, sorts faster, and edits faster.

Once the REORGANIZE option has been selected, the user must provide the name of the relation to be reorganized. Once the relation name has been properly entered, and RETURN pressed for the current default volume, reorganization begins automatically. A rough estimate of the time required to complete the reorganization will be provided and progress reports will be issued every 50 records.

An example of the REORGANIZE utility is provided in Appendix I.

### 3.8 Retrieve, Manipulate, and Plot

The RETRIEVE AND MANIPULATE option is used to manipulate existing relational data. Usually, most of a FEASIL user's time is spent either in Retrieve and Manipulate or in Edit. Examples of the Retrieve and Manipulate option are shown in Appendix J.

After selecting the [RET]rieve and Manipulate command, the user must first specify a relation name. Most users should press RETURN at the prompt for volume label. If the relation name is entered incorrectly, or if the relation does not exist, FEASIL will respond with <<FILE NOT FOUND>>.

Once the relation name and volume label have been properly entered, FEASIL will reproduce a working copy of the relation. This working copy will be used only for the duration of the Retrieve and Manipulate session, and will be automatically deleted as soon as the user exits Retrieve and Manipulate. Any sorting or selecting operations are performed on the working copy, not the original. If any problems are encountered during this reproduction, FEASIL will respond with << REPRODUCTION ERROR...ATTEMPTING RECOVERY >>. Do not be alarmed at this error message. FEASIL will immediately begin a reconstruction process to correct the error. Please refer to Section 4.2 for a more detailed explanation of this reconstruction procedure.

Once the reproduction process is completed, Retrieve and Manipulate is ready to accept commands from the user. A list of the valid commands is included in Appendix J on page J-1. The following sections will provide a detailed description of each command. Many commands will be used successively in a Retrieve and Manipulate session. For instance, a user may first perform an AND operation, then a SORT, then a PRINT, to accomplish one specific task.

### 3.8.1 Quit Command

The [Q]uit command is used to leave the Retrieve and Manipulate utility and return to the main FEASIL menu. An example of the [Q]uit command is included in Appendix J on page J-12.

### 3.8.2 Columns Command

The [C]olumns command provides the user with a list of the names of the columns in the relation being manipulated. The columns command does not change a relation or the data in the relation in any way. An example of this command is included in Appendix J on page J-2.

### 3.8.3 Reproduce Command

The [R]eproduce command is used to copy the relation under manipulation. Once the reproduce command has been selected, the user must provide a name for the copied relation. Because the copied relation must be located on the same volume as the original relation, there is no additional volume prompt. The reproduction is then executed, providing progress reports every few records. An example of the reproduce command is included in Appendix J on page J-2.

### 3.8.4 Print Command

The [P]rint command is used to print the active records under manipulation to the screen, printer, or other device. Print is the primary hardcopy command. Once the [P]rint command has been selected, the user must describe what columns are to be printed and how the output will be formatted. Two examples of the print command are provided in Appendix J on pages J-3 and J-4.

The first prompt to which the user must respond requires the selection of an output device. Device number 1 is the console or screen. Selecting this device will cause the relation to be printed only on the user's terminal. Device number 2 is the printer. Selecting this device will cause the output to be directed to a file called **FEASIL.OUTPUT**. To receive a hardcopy, the user should exit FEASIL, then type the command **PRINT FEASIL.OUTPUT**. This will send the output to the 132 column line printer. If the user wishes to send this file to a different printer, an appropriate device name must be specified. Please consult the system operator for a description of these devices. Device number 3 is a user specified device. This could be a printer or file set up to the user's particular need.

The next series of prompts describe which columns will be printed and in what order they will appear. After the columns are selected, the user may provide a delimiter, or marker, between columns. Often the colon (:) or pipe character (|) is used between columns. Next, the user may specify an empty data delimiter. This string will be printed wherever the data for a particular column is empty. This is often helpful in identifying missing information. Both of these delimiters are optional. If no delimiter is desired, press **RETURN** at the prompts.

The next series of prompts describe how the output will appear on the printed page. First the user is asked if they wish to align the columns themselves. If the user answers **NO**, FEASIL will attempt to automatically format the output. If automatic alignment is not possible, or if the user answers **YES** at the prompt, the user will be asked to specify where on the page each column is to begin. The user must keep the columns in order and must not exceed the page boundaries. After aligning the columns, the user is given the option to add titles to the printout.

An example of printing to the screen is provided in Appendix J on page J-3. An example of printing to the printer is provided in Appendix J on page J-4.

#### 3.8.5 Sort Command

The [S]ort command is used to order the active records in a relation. Sorts may be performed on any column, with any strategy. However, sorts on columns with integer or decimal strategy are faster than sorts on character strings. After selecting the [S]ort option the user must specify on which column to sort. Then, the user must specify the order of the sort, either ascending or descending. Descending sorts are from largest to smallest, or reverse alphabetical order, whichever applies. Ascending sorts are from smallest to largest, or alphabetical order, whichever applies.

FEASIL will then provide a rough estimate of the time required to complete the specified sort, then begin the sort automatically. Examples of the sort command are provided in Appendix J pages J-5 through J-7.

#### 3.8.6 Re-Initialize Command

The [I] re-initialize command is used to "un-do" the effects of a selecting operation such as SORT or AND. The reinitialize command restores all records to the active state. Examples of the re-initialize command are included in Appendix J on pages J-7 and J-10.

### 3.8.7 AND command

The AND command is a selection operation used to separate records having similar characteristics. The AND command will keep active all records that meet the selection criteria and make inactive all records that do not. The AND command might be used to separate numbers or alphabetical lists. Examples of the AND command are included in Appendix J page J-8.

After the AND command has been selected, the user must specify the column on which to select, then the criteria for the selection itself. There are three selection criteria from which the user may choose. These are greater than (>), less than (<), or equal to (=). After the desired selection criteria has been entered, FEASIL prompts the user for a selection value. This value must match the strategy of the column selected for the AND. For example, suppose the user has chosen a column with decimal strategy. Then, if the greater than criteria is selected with a value of 100, FEASIL will keep active only those entries whose data in the selected column is greater than 100.

Examples of the AND command are included in Appendix J on page J-8.

### 3.8.8 OR Command

The OR command is used to separate records having similar characteristics. The OR command works with records that are currently inactive, making active all records that meet the specified selection criteria, and leaving inactive those records which do not.

After the OR command has been selected, the user must specify the column on which to select, then the criteria for the selection itself. There are three selection criteria from which the user may choose. These are greater than (>), less than (<), or equal to (=). After the desired selection criteria has been entered, FEASIL prompts the user for a selection value. This value must match the strategy of the column selected for the OR. For example, suppose the user has chosen a column with decimal strategy. Then, if the greater than criteria is selected with a value of 100, FEASIL will make active those inactive entries whose data in the selected column is greater than 100.

An example of the OR command are included in Appendix J on page J-9.

#### 3.8.9 Move Command

The [M]ove command is used to move active records to a new relation. This command is commonly used following a series of selection operations such as AND or SORT. If a user wishes to preserve a sorted relation or a subset of a relation, the move command is used. After the [M]ove command has been selected, the user is prompted for a relation name, then the volume name. The user should provide a proper relation name, then press RETURN for the volume label. The user is then prompted with "Erase records after moving ?" If the user answers YES to this question, the active records will be erased from the original relation ! A confirmation, which acts as a "failsafe", is required before this operation is actually performed. If the user does not wish to change their original relation, answer NO at the prompt. FEASIL then provides a rough estimate of the time required to complete the move, and provides progress reports every few records. After the move has been completed, FEASIL reports the number of records moved to the new relation.

An example of the [M]ove command is included in Appendix J on page J-9.

#### 3.8.10 Function Command

The [F]unction command is used for mathematical operations such as mean, variance, standard deviation, and summation. After the desired function has been selected, the user must select which column to use. The strategy of the selected column must be either integer or decimal. The function command is not defined for character columns.

An example of the [F]unction command is included in Appendix J on page J-10.

#### 3.8.11 Display Command

The [D]isplay command is used to display relational data as a plot. The user may plot one or more columns as a function of another. An example of the display command is included in Appendix J on page J-11.

#### 3.8.12 Help Command

The Retrieve and Manipulate help facility is, like all command level help, accessed by pressing H. The [H]elp command provides a list and description of the valid Retrieve and Manipulate commands. An example of the help command is included in Appendix J on page J-1.

### 3.9 Backup a Relation

At one time, FEASIL used its own BACKUP utility to transfer relations from disk to magnetic tape. As FEASIL has evolved, it was found that most users prefer to use the VAX "Copy" or "Backup" utility to keep copies of their relations. Now, if the user selects the BACKUP option, instructions are provided on how to use the VAX system level utilities. An example of the BACKUP utility is provided in Appendix K.

All users are highly encouraged to keep tape backup copies of their relations. If the VAX "Copy" utility is used, one relation may be preserved or recovered without necessarily affecting other relations in the user's account. The VAX "Backup" copy is usually used to copy the entire contents of an account onto tape. Either method may be used. **EVERY USER SHOULD MAKE TIMELY BACKUPS OF THEIR RELATIONS !**

### 3.10 Help

FEASIL includes on-line HELP on a number of topics. To access these help facilities, type HELP or the integer 10, from the main FEASIL menu. A complete listing of these help files is included in Appendix L.

At any utility level command prompt, such as EDIT, MODIFY, or any other utility, typing H will display the valid options or commands available at that point.

### 3.11 Status

The STATUS option is used to gain information about a relation. Once the relation name has been properly entered, and RETURN pressed for the current default volume, FEASIL asks if a printer copy is desired. If the user wishes to have a hardcopy of the status report, answer YES at the prompt, otherwise answer NO. FEASIL then asks if the user wishes column information. Usually, the answer to this question is YES. This will provide the user with a list of columns, column names, and column strategies.

After these two questions have been answered, FEASIL reports (1) the total number of characters in the relation, (2) the number of columns, (3) the number of rows (entries), (4) the dead-to-active space ratio. The dead-to-active space ratio is an indication of how efficiently the relation is organized. If the dead-to-active ratio is not zero, use the REORGANIZE utility. A well organized relation takes up less disk space, sorts faster, and edits faster.

An example of the STATUS utility is included in Appendix M.



#### 4.0 COMMON PROBLEMS AND ERRORS

FEASIL is designed to anticipate a variety of errors. When an occasional error or mistake does occur, it should not be cause for alarm. Almost all errors are usually due to minor operator mistakes. Rarely, there are technical problems with the VAX which the user may encounter. Almost all of these errors or mistakes are easily corrected without affecting the user's relations. However, no matter how remote the possibility of unrecoverable error, **EVERY USER SHOULD MAKE TIMELY BACKUPS OF THEIR RELATIONS !**

##### 4.1 Relation Name Improperly Entered

The most common error message is <<FILE NOT FOUND>>. This error message is received when FEASIL is unable to locate the relation which the user has specified. This is usually attributed to a user's typing mistake. If the wrong relation name is specified, or the correct relation name is misspelled, FEASIL will respond with this error message. If a typing mistake is not the cause, the user is probably in the wrong account or subdirectory.

##### 4.2 Improper Termination of FEASIL

If FEASIL is improperly terminated due to a system crash, run-time error, or a control C (^C interrupt), some temporary files, which FEASIL would normally have removed, may be left in the user's directory. If such a premature termination does occur, restart FEASIL, then enter the Retrieve and Manipulate utility. If the error message <<RELATION REPRODUCTION ERROR>> is received during the Retrieve and Manipulate startup, do not be alarmed. FEASIL will immediately begin a recovery procedure to correct this error. This will automatically remove any unnecessary files and re-build any files that were improperly closed. At the end of this recovery procedure, FEASIL may respond with the question, "Activity file present already, delete it and reallocate ?" Normally, the user should answer YES to this question.

If any further problems are encountered, the user should contact the FEASIL superintendent or the system manager.

##### 4.3 Disk Quota Exceeded

Every VAX user is allotted a certain amount of disk storage space, which is defined by the system manager. If this allotment is exceeded, it may result in the improper termination of a FEASIL session. If this should occur, the user should purge their account and remove any unnecessary files before restarting FEASIL. After sufficient disk space has been liberated, restart FEASIL and follow the procedure for improper termination of FEASIL, as detailed in section 4.2 of this report.

If a user has a need for more storage space than their disk quota allows, steps should be taken to minimize the number of relations. If the disk quota is still exceeded, consult the system manager.

#### 4.4 Relation Improperly Sorted

Sorts are performed from within Retrieve and Manipulate. Since Retrieve and Manipulate works on a temporary copy of the relation, any sort exists only while the user is within Retrieve and Manipulate. For instance, if a user desires a sorted printout of a relation, they must use the PRINT utility to print the sorted copy of the relation immediately after performing the necessary SORT operation. As soon as the user exits Retrieve and Manipulate, the relation reassumes its original appearance.

If a user wishes to keep a permanent copy of a sorted relation, they should first perform the necessary sort operation, then use the MOVE utility to transfer the sorted copy to a new relation.

If a user wishes to keep several sorted printouts on file, they should rename the file FEASIL.OUTPUT after each printing session. The command file which starts FEASIL will ask the user if they wish to purge their account. If the user responds YES then only the most recent version of FEASIL.OUTPUT will be retained.

## 5.0 TECHNICAL OVERVIEW

### 5.1 File Structure

FEASIL uses three basic files to construct a relation. These are (1) the Tuple Descriptor File .TDF, (2) the Tuple File .TF, and (3) the Alpha Data File .ADF. The TDF file contains the basic description for a relation, such as the number of columns, the column strategies, and the number of entries. The TF contains all integer, decimal, single character, and "short" (less than 8) character string data, stored in Hollerith format. The ADF contains all other string data stored in string format (256 bytes per record).

The speed of disk accesses are greatly affected by the physical distribution of a file on a disk surface. Therefore, all three FEASIL files are made contiguous (best try). The size of the TDF is static, determined at the creation of the relation. The size ADF and TF vary with the number of entries. Since these are the data storage files, as more entries are made into a relation the size of these files must increase.

### 5.2 Hashing

FEASIL was originally created on an Interdata 8/32 which allowed only 8 character file names. Since FEASIL was capable of supporting 42 character relation names, a hashing system was devised to convert a 42 character relation name into an 8 character file name. As FEASIL evolved to the VAX 11-780, this system was retained, but modified. These modifications allow easier identification of a relation name from its file name.

The hashing procedure presently in use is outlined in the following paragraphs.

(1) The relation name assigned by the user may be 1 to 42 characters in length. This relation name is converted into an eight character hash name.

Example: Relation Name = TEST RELATION NAME  
Hash Name = TESTMAVA  
(this hash name will be derived in the following steps)

(2) The first four characters in the hash name are the same as the first four letters in the relation name.

Example: Relation Name = TEST RELATION NAME  
Hash Name = TEST\*\*\*\*  
(first four)

\*\*\*\* indicates characters yet to be calculated

(3) Subsequent letters are hashed according to their ASCII number. Every character known to the computer has a corresponding ASCII number. A table of these values for letters is provided below:

A = 65	J = 74	S = 83
B = 66	K = 75	T = 84
C = 67	L = 76	U = 85
D = 68	M = 77	V = 86
E = 69	N = 78	W = 87
F = 70	O = 79	X = 88
G = 71	P = 80	Y = 89
H = 72	Q = 81	Z = 90
I = 73	R = 82	space = 32

(4) The fifth character in the hash name is calculated based on the length of the relation name. If the relation name is less than 8 characters long, the fifth character's ASCII number is the number of characters in the relation name plus 64. If the relation name is more than 8 characters long, the fifth character's ASCII number is calculated as the quotient (whole number part) of the division of the number of characters in the relation name by 2, plus 68.

Example: Relation Name = TEST RELATION NAME  
(18 characters long)

$$18/2 = 9$$

$$9 + 68 = 77 \Rightarrow 77 \text{ is ASCII for M}$$

Hash Name = TESTM\*\*\*

\*\*\* indicates characters yet to be calculated

(5) The sixth character of the hash name is calculated based on the characters in the relation name. If the relation name is 5 characters long, the sixth character in the hash name will be an A. If the relation name is longer than 5 characters, a calculation is made. The ASCII numbers for each of the characters in the relation name, after relation name character number 4, are determined. Each of these numbers is then multiplied by another number, which is four less than the position in the relation name. Then the sum of all these multiplications is divided by 26. The remainder of this division, plus 65, is the ASCII number of the sixth character in the hash name.

Example: Relation Name = TEST RELATION NAME  
(18 characters long)

Relation Name Character	Position in Relation	ASCII Number	Position Number Minus 4	Product of ASCII Number and Position Num - 4
space	5	32	1	32
R	6	82	2	164
E	7	69	3	207
L	8	76	4	304
A	9	65	5	325
T	10	84	6	504
I	11	73	7	511
O	12	79	8	632
N	13	78	9	702
space	14	32	10	320
N	15	78	11	858
A	16	65	12	780
M	17	77	13	1001
E	18	69	14	966

---

7306

$7306 / 26 = 281$  remainder 0

$0 + 65 = 65 \Rightarrow$  ASCII number 65 is A

Hash Name = TESTMA\*\*

\*\* indicates characters yet to be calculated

(6) The seventh character in the hash name is also calculated from the characters in the relation name. The sum calculated in step 4 above is divided by 26. The quotient (whole part) of this division is then divided again by 26. The remainder of this second division, plus 65, is the seventh character in the hash name.

Example: Relation Name = TEST RELATION NAME  
(18 characters long)

Sum from Step 4 = 7306

$7306 / 26 = 281$  remainder 0

$281 / 26 = 10$  remainder 21

$21 + 65 = 86 \Rightarrow$  ASCII number 86 is V

Hash Name = TESTMAV\*

\* indicates character yet to be calculated

(7) The eighth character of the hash name is always the letter A.

Example: Relation Name = TEST RELATION NAME

Hash Name = TESTMAVA  
23

### 5.3 Recovery of An Unknown Relation Name

Due to the hashing scheme described in Section 5.2, it is sometimes difficult to determine the name of a relation by merely looking at a directory listing. The hashing scheme is not a one-to-one transformation. Hash names may not be consistently converted into a unique relation name. Therefore, if a user forgets a relation name, it may become necessary to recover a relation name from a hash name.

The Tuple Descriptor File (.TDF) contains the true relation name, stored as a string. The user should use the VAX VMS Dump or Type utilities to display the contents of the .TDF to the screen. The relation name will appear in the first "frame" of the display. The user may then terminate this display, noting the true relation name.

An example of the procedure for recovering a relation name from a hash name is provided in Appendix N.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

FEASIL is a very powerful database management system, which will, no doubt, be used by Systems Evaluation for many years. Several improvements need to be implemented in order to make FEASIL a more efficient tool. Some of these improvements are identified in the following paragraphs.

The most pressing need is for an improvement in speed. Several very large and quickly growing databases have been developed using FEASIL. The time required to sort large relations, especially by character strings, is often excessive. The operating speed of the edit "Find" utility is a related need. A two-part solution might be in order. The first part would be to change from the more I/O intensive "bubble sort" algorithm to the more popular "quick sort." The second part of the solution might be to optimize the FORTRAN code produced by the FLECS precompiler. FLECS generates FORTRAN code which is heavily populated with calculated "GOTO's" and other time consuming statements. If the FLECS precompiler were improved to generate more optimized FORTRAN code, the execution speed of FEASIL would undoubtedly improve.

FEASIL's present plotting capabilities are somewhat limited. The addition of SIXEL graphics capabilities to FEASIL would be very helpful in generating plots and graphs which could be included in MASS11 documents. (MASS11 is a popular VAX word processor.) FEASIL should have the capability to generate a plot from relational data using SIXEL graphics and save it to a file.

FEASIL's mathematical function capabilities should be improved. FEASIL can currently generate summations, means, standard deviations, and variances for a given column. Additional functions to find such things as maximum and minimum values, percent errors, etc. would be useful. The addition of some popular spread-sheeting features such as inter-column comparisons using "cell" definitions would be also useful. Often there is the need for "row-wise" (inter-column) manipulation, for example, to take the data stored in one column, add the corresponding value in another column, then multiply the total by some other factor.

Many of the present FEASIL applications involve generating a standard set of statistical values during a series of engineering tests. A form generating function, similar to the print utility, would make a useful addition. An example would be when a user wishes to perform some statistical functions then insert the statistics, or the data, into a standard, predefined form. Another example might be to generate standard address form for mailing or distribution lists.

In today's dynamic engineering environment, continual improvement and adaptation are necessary for the survival of any system. FEASIL must continue to be revised and upgraded to meet the changing demands of Systems Evaluation.

## 7.0 INDEX TO APPENDICES

The appendices of this report exhaustively exercise every FEASIL option and utility. In order to aid in the use of these examples, an index to these appendices has been provided.

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APPENDIX A  
FEASIL.COM Command File

Appendix A  
FEASIL.COM  
The command file used  
to start FEASIL on the  
VAX 11-780

```
$! This command file is designed to start F.E.A.S.I.L. on a
VAX
$!
$! Written by Bruce Tucker (University of Alabama in
Huntsville)
$! July 1986
$!
$! Suggestions for specific user demands are included as
$! comments.
$!
$! The FEASIL user must have read/write privileges to the
$! account where data files (.TDF,.ADF,.TF) are kept.
$!
$ show def
$!
$! If the FEASIL debug channel is active, the debug files
$! should be frequently purged or deleted. Always keep at
$! least the most current version when in the "debug" mode.
$!
$ Purge AFILE.dat
$!
$! To activate the debug channel ASSIGN a file name
$! (ex. AFILE.dat) to channel 3. This will cause all WRITE's
$! to channel 3 to be recorded in AFILE.DAT
$!
$ assign AFILE          for003
$!
$!
$!
$! sys$command is the default system input device. This is
$! attached to channel 5 through an ASSIGN statement.
$!
$ assign sys$command    for005
$!
$!
$! Output directed to the printer is directed to a file
$! ( FEASIL.OUTPUT). Hardcopy is then obtained by using
$! your system's PRINT utility to print FEASIL.OUTPUT
$!
```

```

$ assign feasil.output for006
$!
$! The printer could be directly ASSIGNED to a channel.
However,
$! this is not recommended on a multi-user system, because
$! the printer que will be dedicated to one FEASIL user.
$!
$! $ assign sys$command    for006
$!
$! Now that proper I/O channels have been assigned, run the
$! actual FEASIL code. This is stored in DABA08.EXE
$!
$ run dja0:[software.feasil]daba08
$!
$! Now DEASSIGN the channels that were previously ASSIGNED.
$ deassign for005
$ deassign for006
$!
$! You only need to DEASSIGN the channel that were ASSIGNED.
$! If not in the "debug" mode, don't deal with channel 3
$ deassign for003
$!
$! Printing can be accomplished automatically upon exiting
$! FEASIL or manually
$! $ print FEASIL.OUTPUT
$!
$! Remind the user of which directory they are in.
$ show def
$stagel:
$      INQUIRE/NOPUNCTUATION P1 "Do you want to PURGE your
                                account (Y or N)?"
$      IF P1 .EQ. "N" THEN goto notok
$      IF P1 .EQ. "Y" THEN GOTO stagelok
$      GOTO stagel
$stagelok:
$stage2:
$      inquire/nopunctuation P2 "Are you REALLY sure of
                                the PURGE (Y or N) ?"
$
$      if p2 .eq. "N" then goto notok
$      if p2 .eq. "Y" then goto stage2ok
$      goto stage2
$stage2ok:
$ purge
$ notok:
$ inquire/nopunctuation P3 "Do you wish to see your
                            DISK QUOTA (Y or N) ?"
$ if p3 .eq. "Y" then show quota

```

APPENDIX B

Quit Option

Appendix B  
Quit Option

-----  
Vax Feasil 7.1.4 February 1987  
-----

- 1 = [Q]uit
- 2 = [C]reate a new relation
- 3 = [D]elete a relation
- 4 = [E]dit a relation
- 5 = [MO]dify column specifications
- 6 = [ME]rge two relations
- 7 = [REO]rganize a relation
- 8 = [RET]rieve, manipulate, or plot data
- 9 = [B]ackup a relation to tape
- 10 = [H]elp
- 11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)  
or corresponding integer Q

FORTRAN STOP

DUAL:[USERDISK1.TUCKER.FEASIL]

Do you want to PURGE your account (Y or N)?

Do you wish to see your DISK QUOTA (Y or N) ?

The statement FORTRAN STOP in the example above is generated by FEASIL to stop the execution of the FORTRAN program. This is how FEASIL is "properly" terminated. The next two questions ask if the user wishes to purge their account and if the user wishes to see their disk quota. The default answers are NO. Section 3.1 provides a detailed description of this procedure.



APPENDIX C  
Create Option

Appendix C  
Create Option

-----  
Vax Feasil 7.1.4 February 1987  
-----

1 = [Q]uit  
2 = [C]reate a new relation  
3 = [D]elete a relation  
4 = [E]dit a relation  
5 = [MO]dify column specifications  
6 = [ME]erge two relations  
7 = [REO]rganize a relation  
8 = [RET]rieve, manipulate, or plot data  
9 = [B]ackup a relation to tape  
10 = [H]elp  
11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)  
or corresponding integer CR

== Create a new relation ==

Enter name for new relation :SAMPLE  
Confirm creation of relation <SAMPLE > <YES OR NO> Y

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

Number of columns(order) of relation :4

Supply column names and strategies as indicated>  
Column strategy choices are:

1-Integer number  
2-Decimal number  
3-Single character  
4-Character string

Column        1  
      Column name :NAME  
      Strategy :4

Column        2  
      Column name :STUDENT NUMBER  
      Strategy :1

Column        3  
      Column name :SCORE  
      Strategy :2

Column        4  
      Column name :GRADE  
      Strategy :3

```

Column 1
  Column name> NAME
  Strategy> 4-character string
Column 2
  Column name> STUDENT NUMBER
  Strategy> 1-integer
Column 3
  Column name> SCORE
  Strategy> 2-decimal
Column 4
  Column name> GRADE
  Strategy> 3-single character

```

Any corrections? <YES OR NO> : N

Relation <SAMPLE > has been created.  
 >> PRESS RETURN TO CONTINUE <<

SAMPLE

NAME	STUDENT NUMBER	GRADE	SCORE

The user has now created a relation called SAMPLE  
 this "looks" like this. Notice that creating a  
 relation does not insert any data.

APPENDIX D  
Delete Option

Appendix D  
Delete Option

-----  
Vax Feasil 7.1.4 February 1987  
-----

- 1 = [Q]uit
- 2 = [C]reate a new relation
- 3 = [D]elete a relation
- 4 = [E]dit a relation
- 5 = [MO]dify column specifications
- 6 = [ME]rge two relations
- 7 = [REO]rganize a relation
- 8 = [RET]rieve, manipulate, or plot data
- 9 = [B]ackup a relation to tape
- 10 = [H]elp
- 11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)  
or corresponding integer D

ENTER NAME OF RELATION TO BE DELETED?  
SAMPLE

CONFIRM DELETION OF <SAMPLE    )>  
                  <YES OR NO> Y

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume.    )  
Volume name >

<< RELATION DELETED >>  
>> PRESS RETURN TO CONTINUE <<

APPENDIX E

Editing a New Relation

Appendix E  
Edit Option

Editing a new  
Relation

-----  
Vax Feasil 7.1.4 February 1987  
-----

- 1 = [Q]uit
- 2 = [C]reate a new relation
- 3 = [D]elete a relation
- 4 = [E]dit a relation
- 5 = [MO]dify column specifications
- 6 = [ME]rge two relations
- 7 = [REO]rganize a relation
- 8 = [RET]rieve, manipulate, or plot data
- 9 = [B]ackup a relation to tape
- 10 = [H]elp
- 11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)  
or corresponding integer E

== Edit a relation ==

Name of relation to be edited :SAMPLE

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

Relation : <<SAMPLE >>  
Number records:       0       Current record:       0  
Number columns:       4       Current column:       1

Display column names <YES OR NO> :Y  
Display how many columns (0 to 4) :4  
Default order (first 4 columns)? <YES or NO>Y

# SAMPLE

NAME	STUDENT NUMBER	GRADE	SCORE

The user has begun editing a relation called sample that "looks" like this. Notice that the number of records is zero, i.e. the relation is empty.

Edit command: +  
 <<Relation empty>>  
 Edit command: I

1.NAME  
 Character string :JONES  
 2.STUDENT NUMBER  
 Integer :12345  
 3.SCORE  
 Decimal :90.2  
 4.GRADE  
 Single character :A  
 NAME > JONES  
 STUDENT NUMBER > 12345  
 SCORE > 90.20000  
 GRADE > A  
 Edit command: I

1.NAME  
 Character string :SMITH  
 2.STUDENT NUMBER  
 Integer :23456  
 3.SCORE  
 Decimal :88.1  
 4.GRADE  
 Single character :B  
 STUDENT NUMBER > 23456  
 SCORE > 88.10000  
 GRADE > B



SAMPLE

NAME	STUDENT NUMBER	GRADE	SCORE
JONES	12345	90.2	A
SMITH	23456	88.1	B

The user has now used the [I]nsert option to add two entries to the relation SAMPLE. After this editing session the relation "looks" like this.

APPENDIX F

Edit Option

Appendix F  
Edit Option

-----  
Vax Feasil 7.1.4 February 1987  
-----

- 1 = [Q]uit
- 2 = [C]reate a new relation
- 3 = [D]elete a relation
- 4 = [E]dit a relation
- 5 = [MO]dify column specifications
- 6 = [ME]rge two relations
- 7 = [REO]rganize a relation
- 8 = [RET]rieve, manipulate, or plot data
- 9 = [B]ackup a relation to tape
- 10 = [H]elp
- 11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)  
or corresponding integer E

== Edit a relation ==

Name of relation to be edited :SAMPLE

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

Relation : <<SAMPLE >>  
Number records: 11 Current record: 1  
Number columns: 4 Current column: 1

Display column names <YES OR NO> :Y  
Display how many columns (0 to 4) :4  
Default order (first 4 columns)? <YES or NO> :Y

# SAMPLE

NAME	STUDENT NUMBER	SCORE	GRADE
SMITH	23456	88.1	B
JONES	12345	90.2	A
ADAMS	54321	70.5	C
MILLER	65432	100.0	A
STEVENS	56789	65.0	D
FRAZIER	22334	45.9	F
HUNTER	67890	85.5	B
KING	35234	52.1	F
DAVIS	22334	75.5	C
GARRETT	77965	60.0	D
BELL	45672	88.0	B

The user has begun to edit a relation called SAMPLE which has 4 column and 11 records (entries). This relation "looks" like this.

The [H] option displays all the valid edit commands.

Edit command: H

THE VALID COMMANDS ARE:

Q	(Quit)	Terminates relation editing
C	(Columns)	List names of each column
P[]	(Print)	Print tuple data
R	(Restart)	Reassign edit descriptors
+[]	('Plus')	Moves tuple pointer forward
-[]	('Minus')	Moves tuple pointer backward
F	(Find)	Search a column for a value or string From current tuple to end of relation, then from start to current
S	(Substitute)	Change the data in a column
E	(Examine)	Set column pointer/display column data
D[]	(Delete)	Delete tuples starting at current tuple
I	(Insert)	Insert data after current tuple
B	(Bottom)	Append tuple to bottom of relation
O[]	(Output)	Save tuple data to a file/device, starting at current tuple
A[]	(Add)	Add tuple data from a file/device
H	(Help)	Obtain this help
?	(Help)	Present current relation status

(NOTE: '[]' Above indicates that a number here  
will cause the command to repeat that many times)

The [C]olumns options displays all the column names.

Edit command: C

- 1 - NAME
- 2 - STUDENT NUMBER
- 3 - SCORE
- 4 - GRADE

The [P]rint option is used to print tuples to the screen.  
The command P3 will print three tuples to the screen.

Edit command: P3

NAME	>JONES	STUDENT NUMBER	>12345	SCORE	>90.20	GRADE	>A
NAME	>SMITH	STUDENT NUMBER	>23456	SCORE	>88.10	GRADE	>B
NAME	>ADAMS	STUDENT NUMBER	>54321	SCORE	>70.50	GRADE	>C

Suppose the user wanted to see only the first three column for awhile. The [R]estart command changes the way the column are displayed during editing.

Edit command: R

Display column names <YES OR NO> :Y  
Display how many columns (0 to 4) :3  
Default order (first 3 columns)? <YES or NO> :Y

NAME	>	ADAMS
STUDENT NUMBER	>	54321
SCORE	>	70.50000

Edit command: R

Display column names <YES OR NO> :Y  
Display how many columns (0 to 4) :4  
Default order (first 4 columns)? <YES or NO> :Y

NAME	>	ADAMS
STUDENT NUMBER	>	54321
SCORE	>	70.50000
GRADE	>	C

The + and - commands are used to move through the relation. The user could move any number forward (+) or any number backward (-) by appending a number.

Edit command: +

NAME	>	MILLER
STUDENT NUMBER	>	65432
SCORE	>	100.00000
GRADE	>	A

Edit command: +5

NAME	>	DAVIS
STUDENT NUMBER	>	22334
SCORE	>	75.50000
GRADE	>	C

Edit command: -5

NAME	>	MILLER
STUDENT NUMBER	>	65432
SCORE	>	100.00000
GRADE	>	A

Suppose the user wishes to make a correction. The name FRAZIER was misspelled. It should be spelled FRASIER. First use the [F]ind option to find the misspelling in column 1. Then use the [S]ubstitute command to correct the mistake.

Edit command: F

Find in which column :1

Find what string :

Character string :FRAZIER

Current record: 6  
Current column: 1  
NAME > FRAZIER  
STUDENT NUMBER > 22334  
SCORE > 45.90000  
GRADE > F

Edit command: S

Column: 1 record: 6

NAME > FRAZIER

Enter new string :

Character string :FRASIER

NAME > FRASIER  
STUDENT NUMBER > 22334  
SCORE > 45.90000  
GRADE > F

Now suppose that the user discovers that FRASIER's score has also been mistakenly entered. First use the [F]ind option to locate FRASIER. Then [E]xamine the column which needs to be changed. Then [S]ubstitute the correct value.

Edit command: F

Find in which column :1

Find what string :

Character string :FRASIER

Current record: 6  
Current column: 1  
NAME > FRASIER  
STUDENT NUMBER > 22334  
SCORE > 45.90000  
GRADE > F

Edit command: E  
Examine which column :3

SCORE > 45.90000

Edit command: S

Column: 3 record: 6

SCORE > 45.90000

Enter new string :

Decimal :45.5

NAME > FRASIER

STUDENT NUMBER > 22334

SCORE > 45.50000

GRADE > F

The user has moved about through the relation using the - (minus) command and realizes that the entry for JONES should be removed. The [D]elete command is used to remove the entry.

Edit command: -

NAME > JONES

STUDENT NUMBER > 12345

SCORE > 90.20000

GRADE > A

Edit command: D1

1 DELETED

NAME > SMITH

STUDENT NUMBER > 23456

SCORE > 88.10000

GRADE > B

If the user wishes to make a new entry at the bottom of the relation the [B]ottom command would be used.

Edit command: B

1.NAME

Character string :ANDREWS

2.STUDENT NUMBER

Integer :35790

3.SCORE

Decimal :75.3

4.GRADE

Single character :C

NAME > ANDREWS

STUDENT NUMBER > 35790

SCORE > 75.30000

GRADE > C



# SAMPLE

NAME	STUDENT NUMBER	SCORE	GRADE
SMITH	23456	88.1	B
JONES	12345	90.2	A
ADAMS	54321	70.5	C
MILLER	65432	100.0	A
STEVENS	56789	65.0	D
FRASIER	22334	45.5	F
HUNTER	67890	85.5	B
KING	35234	52.1	F
DAVIS	22334	75.5	C
GARRETT	77965	60.0	D
BELL	45672	88.0	B
ANDREWS	35790	75.3	C

The user has edited the relation called SAMPLE and made the changes described. The relation now "looks" like this.

If the user wishes to send 10 entries to a file, the [O]utput command would be used. In the example below, 10 entries, starting with the current tuple will be written to an ASCII file called OUTPUT.FILE

Edit command: O

Enter device or file to accept output: OUTPUT.FILE  
 Output how many records :10  
 Enter single character delimiter between data elements ::  
 10 records saved to OUTPUT.FILE

If the user wishes to enter data into the relation from an ASCII file the [A]dd command would be used. The ASCII file must be constructed properly, including a single character delimiter between elements. In the example shown below 10 tuples will be added from the file called INPUT.FILE.

Edit command: A

Enter number of rows to be added :10  
 Enter device or file where data is to come from :INPUT.FILE  
 Enter single character delimiter between data elements ::

<<Data has been entered into relation>>

If the user wants information about the relation being edited, use the [?] command. In the example shown below, the relation is named SAMPLE. SAMPLE has 22 entries and 4 columns. The current tuple is the bottom entry, number 22.

Edit command: ?

Relation :	<<SAMPLE	>>	
Number records:	22	Current record:	22
Number columns:	4	Current column:	4

Edit command: Q

>> PRESS RETURN TO CONTINUE <<

APPENDIX G

Modify Option

# Appendix G Modify Option

Vax Feasil 7.1.4 February 1987

- 1 = [Q]uit
- 2 = [C]reate a new relation
- 3 = [D]elete a relation
- 4 = [E]dit a relation
- 5 = [MO]dify column specifications
- 6 = [ME]rge two relations
- 7 = [REO]rganize a relation
- 8 = [RET]rieve, manipulate, or plot data
- 9 = [B]ackup a relation to tape
- 10 = [H]elp
- 11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)  
or corresponding integer MO

== Modify column specifications ==

Relation to be modified :SAMPLE

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

Modcol command >H

The valid commands are:

R	(Rename)	rename a column
D	(Delete)	delete a column
A	(Add)	add a column
C	(Columns)	list column names
Q	(Quit)	quit modify column specifications

## SAMPLE

NAME	STUDENT NUMBER	SCORE	GRADE
------	-------------------	-------	-------

The user has entered a relation called SAMPLE.  
The relation "looks" like this.

Modcol command >C

Column	1-	NAME
Column	2-	STUDENT NUMBER
Column	3-	SCORE
Column	4-	GRADE

The user wishes to add a column to the existing relation SAMPLE. The new column is to contain character string data, and will be called SOCIAL SECURITY NUMBER. The [A]dd command is used to add the new column.

Modcol command >A

Column after which to add the new column :4  
New column name :SOCIAL SECURITY NUMBER

Strategy :

- 1-Integer number
- 2-Decimal number
- 3-Single character
- 4-Character string

<Enter by number>4

Modcol command >C

Column	1-	NAME
Column	2-	STUDENT NUMBER
Column	3-	SCORE
Column	4-	GRADE
Column	5-	SOCIAL SECURITY NUMBER

The user has decided to rename a column. The [R]ename command is used.

Modcol command >R

Column to rename :5  
New column name :S.S. NUMBER  
Column: 5 is now named:  
S.S. NUMBER

Modcol command >C

Column	1-	NAME
Column	2-	STUDENT NUMBER
Column	3-	SCORE
Column	4-	GRADE
Column	5-	S.S. NUMBER

The user has now decided to delete a column. The [D]elete command is used to delete a column.

Modcol command >D

Column to be deleted :5  
Confirm deletion of column 5 named:  
S.S. NUMBER  
<YES OR NO> :Y

Modcol command >Q

>> PRESS RETURN TO CONTINUE <<  
G-2

APPENDIX H  
Merge Option

Appendix H  
Merge Option

-----  
Vax Feasil 7.1.4 February 1987  
-----

- 1 = [Q]uit
- 2 = [C]reate a new relation
- 3 = [D]elete a relation
- 4 = [E]dit a relation
- 5 = [MO]dify column specifications
- 6 = [ME]rge two relations
- 7 = [REO]rganize a relation
- 8 = [RET]rieve, manipulate, or plot data
- 9 = [B]ackup a relation to tape
- 10 = [H]elp
- 11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)  
or corresponding integer ME

PRIMARY MERGE RELATION?>  
SAMPLE

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

SECONDARY MERGE RELATION?>  
SECOND RELATION

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

MERGE>  
H

THE VALID COMMANDS ARE:  
Q (QUIT) QUIT "MERGE"  
R (RESTART) RESTART "MERGE"  
A (ADD) ADD TWO RELATIONS  
M (MERGE) MERGE TWO RELATIONS  
H (HELP) OBTAIN THIS HELP

SAMPLE				SECOND RELATION			
NAME	STUDENT NUMBER	SCORE	GRADE	NAME	STUDENT NUMBER	SCORE	GRADE
SMITH	23456	88.1	B	JAMES	99001	65.3	D
JONES	12345	90.2	A	BYRON	34870	40.0	F
ADAMS	54321	70.5	C	MCDANIEL	55667	99.0	A
MILLER	65432	100.0	A				
STEVENS	56789	65.0	D				
FRASIER	22334	45.5	F				
HUNTER	67890	85.5	B				
KING	35234	52.1	F				
DAVIS	22334	75.5	C				
GARRETT	77965	66.0	D				
BELL	45672	88.0	B				
ANDREWS	35790	75.3	C				
The user has selected two relations SAMPLE and SECOND RELATION for the merge operation. These two relations will be added together using the [A]dd command to form a third relation called OUTPUT FROM AN ADD, which will be shown below.							

MERGE>  
A

NAME OF ADDED RELATION?>  
OUTPUT FROM AN ADD

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

20 moved so far  
MERGE>



OUTPUT FROM AN ADD

NAME	STUDENT NUMBER	SCORE	GRADE
SMITH	23456	88.1	B
JONES	12345	90.2	A
ADAMS	54321	70.5	C
MILLER	65432	100.0	A
STEVENS	56789	65.0	D
FRASIER	22334	45.5	F
HUNTER	67890	85.5	B
KING	35234	52.1	F
DAVIS	22334	75.5	C
GARRETT	77965	60.0	D
BELL	45672	88.0	B
ANDREWS	35790	75.3	C
JAMES	99001	65.3	D
BYRON	34870	40.0	F
MCDANIEL	55667	99.0	A

After the [A]dd command was used, all the entries from SAMPLE were added to all the entries from SECOND RELATION, to form a new relation called OUTPUT FROM AN ADD.

MERGE> R

PRIMARY MERGE RELATION?> SAMPLE

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

SECONDARY MERGE RELATION?> SECOND SAMPLE

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

SAMPLE				SECOND SAMPLE		
NAME	STUDENT NUMBER	SCORE	GRADE	NAME	S.S. NUMBER	AGE
SMITH	23456	88.1	B	SMITH	425-90-9872	31
JONES	12345	90.2	A	ADAMS	555-00-1234	20
ADAMS	54321	70.5	C	MILLER	554-75-4099	55
MILLER	65432	100.0	A	PERRY	422-90-9244	40
STEVENS	56789	65.0	D	PARKER	323-98-5639	22
FRASIER	22334	45.5	F			
HUNTER	67890	85.5	B			
KING	35234	52.1	F			
DAVIS	22334	75.5	C			
GARRETT	77965	66.0	D			
BELL	45672	88.0	B			
ANDREWS	35790	75.3	C			
The user has selected two relations SAMPLE and SECOND SAMPLE for the merge operation. These two relations will be joined together using the [M]erge command to form a third relation called OUTPUT FROM A MERGE, which will be shown below.						

MERGE> M

NAME OF MERGED RELATION?> OUTPUT FROM A MERGE

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

1 column match  
Merged relation will be 6 columns wide  
< 3 RECORDS RESULTED FROM THIS MERGE>

OUTPUT FROM A MERGE					
NAME	STUDENT NUMBER	SCORE	GRADE	S.S. NUMBER	AGE
SMITH	23456	88.1	B	425-90-9872	31
ADAMS	54321	70.5	C	555-00-1234	20
MILLER	65432	100.0	A	554-75-4099	55
After the merge operation a composite output relation is created which consists of the intersecting entries and the union of the columns.					

MERGE> Q

>> PRESS RETURN TO CONTINUE <<

APPENDIX I  
Reorganize Option

Appendix I  
Reorganize Option

-----  
Vax Feasil 7.1.4 February 1987  
-----

- 1 = [Q]uit
- 2 = [C]reate a new relation
- 3 = [D]elete a relation
- 4 = [E]dit a relation
- 5 = [MO]dify column specifications
- 6 = [ME]erge two relations
- 7 = [REO]rganize a relation
- 8 = [RET]rieve, manipulate, or plot data
- 9 = [B]ackup a relation to tape
- 10 = [H]elp
- 11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)  
or corresponding integer REO

Relation Reorganization:

Name of relation to be reorganized ? >SAMPLE

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

<< Beginning reorganization >>  
This will only take a minute.  
Working on records 0 through 50.

<< Relation: SAMPLE reorganized >>  
                    << Reorganization complete >>

>> PRESS RETURN TO CONTINUE <<

APPENDIX J

Retrieve and Manipulate Option

Appendix J  
Retrieve and Manipulate Option

-----  
Vax Feasil 7.1.4 February 1987  
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1 = [Q]uit  
2 = [C]reate a new relation  
3 = [D]elete a relation  
4 = [E]dit a relation  
5 = [MO]dify column specifications  
6 = [ME]rge two relations  
7 = [REO]rganize a relation  
8 = [RET]rieve, manipulate, or plot data  
9 = [B]ackup a relation to tape  
10 = [H]elp  
11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)  
or corresponding integer RET

== Retrieve, manipulate, or plot relation ==  
Name of relation to be manipulated :SAMPLE

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

Copying relation to scratch area to protect original.  
<<COPYING TF RECORD                   0 >>  
<<COPYING ADF RECORD                   0 >>  
Ready for manipulation :

Ret & Man command: H

The legal commands are:

Q (Quit)	terminates relation manipulation
C (Columns)	list names of each column by number
R (Reproduce)	copies relation under manipulation
P (Print)	prints relations data (active records)
S (Sort)	sorts a relation for printing
I (Re-Initialize)	initializes or re-initializes all records to active state.
A (And)	keeps active only those active records that meet the selection criteria.
O (Or)	makes active all records that meet the selection criteria.
M (Move)	moves active records to new relation
F (Function)	takes user into function mode.
D (Display)	displays data as plot
H (Help)	list of legal commands

Ret & Man command: C

1-NAME  
2-STUDENT NUMBER  
3-SCORE  
4-GRADE

Suppose the user wishes to copy all active records into a new relation called NEW RELATION NAME. The [R]eproduce command accomplished this.

Ret & Man command: R

Copied relation name :NEW RELATION NAME

<<COPYING TF RECORD                    0 >>  
<<COPYING ADF RECORD                   0 >>  
    <<Relation reproduced>>



Suppose the user wishes to print a relation to the screen. The console is the user's screen.

Ret & Man command: P

<SELECT OUTPUT DEVICE>

<OPTIONS ARE: 1 -CONSOLE  
2 -PRINTER  
3 -OTHER  
4 -CANCEL

<ENTER SELECTION BY NUMBER 1,2,3 OR 4>

RM?> 1

PRINT HOW MANY COLUMNS?> 4

DEFAULT ORDER?> <YES OR NO> Y

DELIMITER BETWEEN COLUMNS <MAY BE NULL?> :

EMPTY DATA DELIMITER <MAY BE NULL> ?>

DO YOU WANT TO ALIGN THE COLUMNS YOURSELF?> Y

POSITION TO BEGIN COLUMN 1?> 0

POSITION TO BEGIN COLUMN 2?> 10

POSITION TO BEGIN COLUMN 3?> 20

POSITION TO BEGIN COLUMN 4?> 30

ARE COLUMN ALIGNMENTS OK?> <YES OR NO> Y

DO YOU WANT TITLES?> <YES OR NO> Y

HOW MANY?> 1

TITLE ROW 1?> SAMPLE TITLE

NAME	SAMPLE TITLE			
	: STUDENT	: SCORE	: GRADE	
	: NUMBER	:		
SMITH	: 23456	: 88.10	: B	
JONES	: 12345	: 90.20	: A	
ADAMS	: 54321	: 70.50	: C	
MILLER	: 65432	: 100.00	: A	
STEVENS	: 56789	: 65.00	: D	
FRASIER	: 22334	: 45.50	: F	
HUNTER	: 67890	: 85.50	: B	
KING	: 35234	: 52.10	: F	
DAVIS	: 22334	: 75.50	: C	
GARRETT	: 77965	: 66.00	: D	
BELL	: 45672	: 88.00	: B	
ANDREWS	: 35790	: 75.30	: C	

>>OUTPUT COMPLETE>

In the example below, the user is printing a relation to the printer. The user wishes to list columns 1 through 4 then repeat column 2. Therefore, the user specifies that they wish to print a total of 5 columns (the relation has only 4), then repeat column 2.

Ret & Man command: P

<SELECT OUTPUT DEVICE>

<OPTIONS ARE: 1 -CONSOLE  
2 -PRINTER  
3 -OTHER  
4 -CANCEL

<ENTER SELECTION BY NUMBER 1,2,3 OR 4>

RM?> 2

PRINT HOW MANY COLUMNS?> 5

PRINT IN COLUMN NUMBER 1?> 1

PRINT IN COLUMN NUMBER 2?> 2

PRINT IN COLUMN NUMBER 3?> 3

PRINT IN COLUMN NUMBER 4?> 4

PRINT IN COLUMN NUMBER 5?> 2

DELIMITER BETWEEN COLUMNS <MAY BE NULL>?> :

EMPTY DATA DELIMITER <MAY BE NULL> ?>

DO YOU WANT TO ALIGN THE COLUMNS YOURSELF?> Y

POSITION TO BEGIN COLUMN 1?> 0

POSITION TO BEGIN COLUMN 2?> 10

POSITION TO BEGIN COLUMN 3?> 20

POSITION TO BEGIN COLUMN 4?> 30

POSITION TO BEGIN COLUMN 5?> 40

ARE COLUMN ALIGNMENTS OK?> <YES OR NO> Y

DO YOU WANT TITLES?> <YES OR NO> Y

HOW MANY?> 1

TITLE ROW 1?> SAMPLE TITLE

>>OUTPUT COMPLETE>

The output has actually been sent to a file called FEASIL.OUTPUT. The user must then exit FEASIL and enter the command PRINT FEASIL.OUTPUT to send the file to the printer.

The user wishes to sort the relation SAMPLE by student number (column 2). The user wishes to see the smallest student number first and the largest student number last. Therefore, using the [S]ort command, sorting on column 2, in ascending order, will accomplish this purpose.

Ret & Man command: S

Column on which to sort :2  
Ascending or Descending sort (A or D) :A  
This should require less than 2 minutes.  
Sort on column 2 complete>

After the sort described above, the copy of the relation kept in memory would be sorted as shown below. If the user printed the relation immediately following the sort it would appear as shown below.

JONES	12345	90.2	A
FRASIER	22334	45.5	F
DAVIS	22334	75.5	C
SMITH	23456	88.1	B
KING	35234	52.1	F
ANDREWS	35790	75.3	C
BELL	45672	88.0	B
ADAMS	54321	70.5	C
STEVENS	56789	65.0	D
MILLER	65432	100.0	A
HUNTER	67890	85.5	B
GARRETT	77965	66.0	D

Now the user wishes to see an alphabetical list of all students. Therefore, [S]ort on column 1 (NAME) in ascending order.

Ret & Man command: S

Column on which to sort :1

Ascending or Descending sort (A or D) :A

Sort on column 1 complete>

After the sort described above, the copy of the relation kept in memory would be sorted as shown below. If the user printed the relation immediately following the sort it would appear as shown below.

ADAMS	54321	70.5	C
ANDREWS	35790	75.3	C
BELL	45672	88.0	B
DAVIS	22334	75.5	C
FRASIER	22334	45.5	F
GARRETT	77965	66.0	D
HUNTER	67890	85.5	B
JONES	12345	90.2	A
KING	35234	52.1	F
MILLER	65432	100.0	A
SMITH	23456	88.1	B
STEVENS	56789	65.0	D

The user wishes to see a list of students in the order of their grade. This calls for an ascending sort on column 3, as shown below.

Ret & Man command: S

Column on which to sort :3  
Ascending or Descending sort (A or D) :D  
This should require less than 2 minutes.  
Sort on column 3 complete>

After the sort described above, the copy of the relation kept in memory would be sorted as shown below. If the user printed the relation immediately following the sort it would appear as shown below.

MILLER	65432	100.0	A
JONES	12345	90.2	A
SMITH	23456	88.1	B
BELL	45672	88.0	B
HUNTER	67890	85.5	B
DAVIS	22334	75.5	C
ANDREWS	35790	75.3	C
ADAMS	54321	70.5	C
GARRETT	77965	66.0	D
STEVENS	56789	65.0	D
KING	35234	52.1	F
FRASIER	22334	45.5	F

If the user wishes to un-do a SORT, AND, OR, etc., and restore the copy of the relation in memory back to its original condition, use the [I] re-initialize command. This is equivalent to leaving Retrieve and Manipulate and starting over.

Ret & Man command: I

Suppose the user wishes to find all the students who have a score greater than 90. The AND command would be used for this. AND on column 3 (GRADE), with the selection criteria > a value of 90. This operation will leave only the entries that meet the selection criteria active in memory.

Ret & Man command: A  
Column on which to select :3  
Selection criteria (options <,> or =) (which one): >  
value :90  
< Anding on column 3 complete >  
Selection process complete-active records = 4

After the AND operation has been completed, two records are left active. If the user printed the relation immediately after the AND, it would appear as shown below.

MILLER	65432	100.0	A
JONES	12345	90.2	A

If the AND operation were again used, this time to select all grades greater than 100, the selection criteria would be >, the value would be 100.

Ret & Man command: A  
Column on which to select :3  
Selection criteria (options <,> or =) (which one) :>  
value :100  
< Anding on column 3 complete >  
Selection process complete-active records = 0

As shown above, there are no records that meet the selection criteria. Therefore, no records are left active. If the user were to print out the relation at this point there would be nothing except column headings on the printout.

The previous AND example left no active records in memory. Now if the user wished to make active all entries who have a score greater than 75, the OR command would be used. This would mean an OR on column 3 (SCORE), selection criteria greater than (>), the value 75. An example of this is shown below.

Ret & Man command: O  
 Column on which to select :3  
 Selection criteria (options <,> or =) (which one) :>  
 value :75  
 < Oring on column 3 complete >  
 Selection process complete-active records = 7

After the OR operation just described, 7 records or entries, would have been made active. If the user were to print the relation following this operation, it would "look" like this:

MILLER	65432	100.0	A
JONES	12345	90.2	A
SMITH	23456	88.1	B
BELL	45672	88.0	B
HUNTER	67890	85.5	B
DAVIS	22334	75.5	C
ANDREWS	35790	75.3	C

Now if the user wished to create a new relation made up of the current active records, the MOVE command would be used. A new relation with identical column description to the parent relation will be created. All the active records will be copied into the new relation.

Ret & Man command: M  
 Relation to move records to :NAME OF MOVED RELATION  
 WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
 (default =Current system default volume. )  
 Volume name >  
 Erase records after moving : <YES OR NO> :N

This will only take a minute.  
 7 Records moved to NAME OF MOVED RELATION

The reinitialize command brings all records in the parent relation back to the active state. This un-does all AND's, OR's, SORT's, etc.

Ret & Man command: I

Suppose the user wanted to know the mean (average) score and the standard deviation for all the entries in the relation. The FUNCTION command would be used to perform this operation. In the example below the average score (column 3) was found to be 75.14 with a standard deviation of 16.24.

Ret & Man command: F

The following functions are available:

- 0) CANCEL
- 1) Total column data
- 2) Mean, Variance, and Standard Deviation

<<Enter selection by number?>>

Function Command: 2  
Column to use?> 3

Statcal Information for column 3

Column Name	:	SCORE
Number of Active Records	:	12
Number of Non-Empty Entries	:	12
Mean	=	75.1417
Std.Dev.	=	16.2450
Variance	=	263.9006

If the user attempts to perform mathematical operations on a column with string or single character strategy, FUNCTION will remind the user of an error.

Ret & Man command: F

The following functions are available:

- 0) CANCEL
- 1) Total column data
- 2) Mean, Variance, and Standard Deviation

<<Enter selection by number?>>

Function Command: 2  
Column to use?> 4

<<Column strategy does NOT allow addition>>



Data may be displayed as a simple plot using the  
DISPLAY command.

Ret & Man command: D

COLUMN NUMBER FOR THE X-AXIS VARIABLE> 3  
COLUMN NUMBER FOR THE Y-AXIS VARIABLE> 3  
DO YOU WISH TO ADD ANOTHER FUNCTION  
TO THE DISPLAY? <YES OR NO> Y  
COLUMN NUMBER FOR THE Y-AXIS VARIABLE> 3  
DO YOU WISH TO ADD ANOTHER FUNCTION  
TO THE DISPLAY? <YES OR NO> N

STATUS REPORT

\*\* X-AXIS \*\*

COLUMN 3 NAME: SCORE  
DATA RANGE: ( 45.5000000, 100.0000000)  
AXIS RANGE: ( 45.5000000, 100.0000000)

\*\* Y-AXIS \*\*

AXIS RANGE: ( 45.5000000, 100.0000000)

COLUMN 3: SCORE  
DATA RANGE: ( 45.5000000, 100.0000000) MARKER = \*

COLUMN 3: SCORE  
DATA RANGE: ( 45.5000000, 100.0000000) MARKER = 2

PLOT>  
H

THE LEGAL COMMANDS ARE:

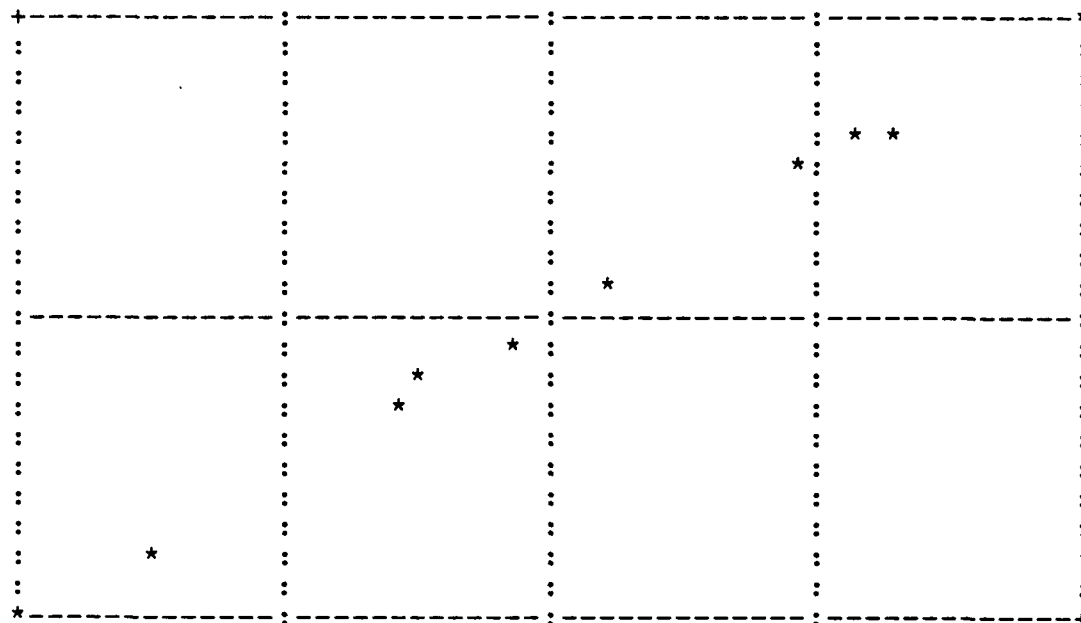
Q (QUIT) TERMINATE PLOTTING PROGRAM  
R (RESET) RESET PLOTTING PROGRAM  
S (STATUS) PRINT STATUS REPORT  
X (X-AXIS) SET X-AXIS RANGE  
Y (Y-AXIS) SET Y-AXIS RANGE  
P (PLOT) DISPLAY THE PLOT  
? LIST THE LEGAL COMMANDS  
LI (LINE) CONNECT DATA POINTS WITH LINES  
LA (LABEL) CREATE X AND Y AXIS LABELS

PLOT> P

SELECT A DISPLAY DESTINATION:

- (1) TYPE C FOR THE CONSOLE
- (2) TYPE L FOR THE LINE PRINTER
- (3) TYPE P FOR THE PLOTTER

C



PLOT>

Q

Ret & Man command: Q

>> PRESS RETURN TO CONTINUE <<

APPENDIX K  
Backup Option

Appendix K  
Backup Option

-----  
Vax Feasil 7.1.4 February 1987  
-----

- 1 = [Q]uit
- 2 = [C]reate a new relation
- 3 = [D]elete a relation
- 4 = [E]dit a relation
- 5 = [MO]dify column specifications
- 6 = [ME]rge two relations
- 7 = [REO]rganize a relation
- 8 = [RET]rieve, manipulate, or plot data
- 9 = [B]ackup a relation to tape
- 10 = [H]elp
- 11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)  
or corresponding integer B

" BACKUP "

Backup is now accomplished through the VAX operating system "backup" utility. Use the "backup" command to save all FEASIL files. These files will have the extensions .ADF, .TDF, and .TF. If you use wildcards, (eg. \*.ADF, \*.TDF, \*.TF ) you will backup all FEASIL files in the directory.

The VAX "copy" command can be used to copy files to tape but this takes up much more tape space than a backup.

The same backup (or copy) procedure is applied whether going from disk to tape or going the other direction. You must exit FEASIL before beginning the backup procedure. If you need help backing up or using the tape drive, contact the system operator 876-9624.

If you wish to transfer files between two different computer systems, for instance, Perkin-Elmer to VAX, special steps must be taken. If a user wishes to perform such a transfer or experience any problems with FEASIL, contact:

Bruce Tucker            876-4512.

>> PRESS RETURN TO CONTINUE <<

APPENDIX L

Online Help Option

Appendix L  
Online Help Option

-----  
Vax Feasil 7.1.4 February 1987  
-----

- 1 = [Q]uit
- 2 = [C]reate a new relation
- 3 = [D]elete a relation
- 4 = [E]dit a relation
- 5 = [MO]dify column specifications
- 6 = [ME]rge two relations
- 7 = [REO]rganize a relation
- 8 = [RET]rieve, manipulate, or plot data
- 9 = [B]ackup a relation to tape
- 10 = [H]elp
- 11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)  
or corresponding integer 10

Enter help category or <RETURN> for menu.>

THE VALID HELP PARAMETERS ARE:

BACKUP	CREATE
DELETE	EDIT
MERGE	MODIFY
REORGANIZE	RETRIEVE
STATUS	COLUMN
RECORD	VOLUME
STRATEGY	NAME
PRINT	SORT
DEVICE	PLOT

Enter help category or <RETURN> for menu.>  
BACKUP

" BACKUP "

Backup is now accomplished through the VAX operating system "backup" utility. Use the "backup" command to save all FEASIL files. These files will have the extensions .ADF, .TDF, and .TF. If you use wildcards, (eg. \*.ADF, \*.TDF, \*.TF ) you will backup all FEASIL files in the directory.

The VAX "copy" command can be used to copy files to tape but this takes up much more tape space than a backup.

The same backup (or copy) procedure is applied whether going from disk to tape or going the other direction. You must exit FEASIL before beginning the backup procedure. If you need help backing up or using the tape drive, contact the system operator 876-9624.

If you wish to transfer files between two different computer systems, for instance, Perkin-Elmer to VAX, special steps must be taken. If a user wishes to perform such a transfer or experience any problems with FEASIL, contact:

Bruce Tucker            876-4512.

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
DELETE

" DELETE "

The DELETE option is used to permanently remove a relation from a specified volume. DELETE removes all the files associated with the specified FEASIL relation. These files are the .ADF, .TDF, and .TF.

Once the delete option has been selected the user is prompted for a relation name. Then, the user is asked for confirmation. If you desire to cancel the delete option, answer N to the confirmation. Otherwise, the relation will be deleted. After receiving confirmation, the proper location (volume) must be provided. Deleting a relation should take only a few seconds.

See help on: VOLUME, NAME.

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
MERGE

IS TO PRODUCE A THIRD RELATION FROM TWO INPUT RELATIONS BY PERFORMING A "MERGE". THE MERGE FUNCTION IS A "UNION" OPERATOR. THEREFORE, THE OUTPUT RELATION CONSISTS OF THE TOTAL NUMBER OF UNIQUE COLUMNS IN THE TWO INPUT RELATIONS. THE ONLY RECORDS WHICH ARE MAINTAINED THROUGH THE "MERGE" ARE THE ONES WHICH INTERSECT ONE-TO-ONE WITHIN THOSE COLUMNS WHOSE NAMES INTERSECT ONE-TO-ONE.

THE SECOND PURPOSE IS TO PRODUCE A THIRD RELATION FROM TWO INPUT RELATIONS WHICH HAVE IDENTICAL COLUMN NAMES AND STRATEGIES. THE RESULTING RELATION HAS THE SAME COLUMN NAMES AS THE TWO INPUT RELATIONS AND THE RECORDS OF THE OUTPUT RELATION ARE A "UNION" OF THE TWO INPUT RELATIONS.

SEE ALSO: COLUMN, RECORD, STRATEGY

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
REORGANIZE

The REORGANIZE option is used to increase the storage efficiency of a FEASIL relation.

After adding or deleting columns, some types of sorting, or merging, a relation may accumulate significant amounts of "dead space". This causes the relation to occupy excessive disk space, and slows sorting or plotting operations. The STATUS option is used to determine, among other things, the "dead-to-active space ratio." If this ratio is not zero, use REORGANIZE.

After entering REORGANIZE, the user is prompted for name and volume information. Then, the user is given an estimate of the time to complete the reorganization. Progress updates are issued every 50 records. A reorganization may take only a few seconds or several minutes, depending upon relation size.

See help on: COLUMN, MODIFY, STATUS, VOLUME.

>> PRESS RETURN TO CONTINUE <<



Enter help category or <RETURN> for menu.>  
STATUS

" STATUS "

The STATUS option is used to inquire about the characteristics of a relation.

STATUS reports the number of characters, columns, and rows in a relation. Also, it reports on the "dead-to-active space ratio". If this ratio is not zero, the relation is inefficiently stored and is occupying excessive disk space. If this is the case, use the REORGANIZE option.

STATUS asks if a printer copy is desired and if column information is desired. If column information is desired, STATUS also lists the column numbers, strategies, and names.

See help on: REORGANIZE, NAME, COLUMN, RECORD

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
RECORD

" RECORD "

"Record" is the collection of columns which comprise an entry in a relation. A record may be thought of as a row or "tuple" in the database. Naturally, the number of records is equal to the number of entries. Each time a new entry is made, a new record is added. "Status" provides information about the number of records in a specific relation.

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
STRATEGY

" STRATEGY "

Strategy is a term used to describe the type of data contained in a particular column. Only one type of data may be present in each column.

Although there are no restrictions on strategy selection (except for the data itself), the user should be aware that the choice of strategy does affect sorting times and required storage space. Sorts are much faster on columns with integer strategy than on columns with character string strategy. A relation that contains several columns with character string strategy requires more disk space than a relation with only several integer columns.

Valid strategies	Examples
1. Integers -----	1, 5, 10223, etc.
2. Decimal (real) numbers ----	2.4, -5.1, 1077.778
3. Single Character -----	A, b, 9, *, T
4. Character string -----	NAME, 3-BIG-NUMBERS, \$GET_3_LETTERS, *****

See help on COLUMN

>> PRESS RETURN TO CONTINUE <<  
Enter help category or <RETURN> for menu.>  
PRINT

" PRINT "

"Print" allows the user to print relational data. Any part of a relation may be printed. And, since "print" is embedded in retrieve and manipulate, sorts may be easily printed.

Once in Retrieve and Manipulate, option "P" is used to enter Print. The user must then select an output device. Once a device is selected, the user must supply the number of columns to be printed. This may vary from 1 to the total number of columns. Entering zero cancels Print. The next series of prompts establish the order in which to print the columns. Print then prompts for a delimiter between columns. A colon or vertical bar is a good suggestion. Enter "return" if no delimiter is desired. The empty data delimiter will be printed wherever empty data is present. Asterisks are often used. Enter "return" for blanks.

If the user wishes to align the columns, enter "Y" to the next question. Print will then ask for the column number in which to begin printing each column. Titles may be added if desired.

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
DEVICE

" DEVICE "

"Device" is a term used to refer to a peripheral attached to the computer. These are logical devices that the computer uses to transfer or store data. Some devices are the terminal, the printer, a disk drive, a plotter, or a tape drive. These devices are referred to by their logical names. Refer to your current system configuration for specific names:

Examples of device names are:

LWA0: .... a printer  
LWB0: .... a printer  
TI: .... console  
CON: .... console  
MSA0: .... tape drive  
DUA1: .... disk drive  
DJB4: .... disk drive

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
CREATE

" CREATE "

The "create" option is used to create the files associated with every FEASIL relation. These files are the .ADF, .TDF, and .TF. This is the first step in organizing a database through FEASIL.

In order to create a relation the user must completely describe it to FEASIL. Once the CREATE option has been selected, a relation name must be selected and confirmed. The user then selects the volume where the relation is to be located. Then, the number of columns must be specified. The user must supply a column name and strategy for each column. Finally, FEASIL asks if there are any corrections. If there are none, the relation is created on the selected volume and FEASIL returns to the main menu.

See help on: STRATEGY, COLUMN, VOLUME, NAME

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
EDIT

" EDIT "

The edit option is used to enter or modify data in a relation. Data is initially entered through edit, then may be modified as needed.

Once the edit option has been selected, the user must provide the relation name and its location (volume). Then, the user is given options whether to display columns names and, if so, how many. The user may then decide what order to display the columns in. These options are only for convenience in editing and do not affect the relation.

Once the appropriate display options have been selected, the user is free to manipulate data within the specified relation. It should be noted that EDIT allows data manipulations but does not allow for relation or column manipulations. If relation or column manipulations are desired, MODIFY or RETRIEVE AND MANIPULATE should be chosen.

See help on: VOLUME, NAME

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
MODIFY

" MODIFY "

The MODIFY option is used to manipulate columns within an existing relation.

MODIFY allows the user to:

1. Rename an existing column
2. Delete an existing column
3. Add a new column
4. Display a list of existing columns

After deleting or adding columns, it is a good idea to REORGANIZE your relation. Deleting or adding columns creates "dead space" which is removed through REORGANIZE.

See help on: REORGANIZE, COLUMN

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
RETRIEVE

" RETREIVE AND MANIPULATE "

The RETREIVE AND MANIPULATE option is used to manipulate existing data within a specified relation.

Retrieve and Manipulate allows the user to:

1. Display column names.
2. Reproduce a relation (copy under a new name).
3. Print part or all of a relation. This option is the primary FEASIL output media.
4. Sort a relation, in either ascending or decending order.
5. Reinitialize a relation (restores all records to active state).
6. AND"s or OR"s column data.
7. Move active records to a new relation. Primarily used to save sorts.
8. Find total, or mean and variance of a column.
9. Display data as a plot.

See help on: COLUMN, DEVICE, NAME, SORT, PRINT, PLOT

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
COLUMN

" COLUMN"

"Column" is the name given to each category of a relation. Each column has a column name and column strategy. The column name may be any combination the user wishes, of up to 72 characters. The column strategy must be one of the four valid strategies. (See help on STRATEGY.)

Every record has an entry (which could be empty) in every column.

A relation containing information about school grades might contain the following columns.

Column name	Strategy	Sample entry
1. Student Name	character string	Jones,Joe
2. Student Number	integer	12345
3. Score	decimal	95.3
4. Grade	single character	A

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
VOLUME

" VOLUME "

"Volume" is the name of the storage media (disk, tape, etc.) where a relation is located. These are also known as logical device names.

Generally, a user will select default (press return) when prompted for a volume name. The default is the current disk and account. This is usually set by the VAX operating system. The user will be shown this default during the FEASIL startup procedure.

If the user wishes to select a volume other than the default, that user should first check with the system operator to insure that the user has the necessary system privileges.

Examples are: DUA1: MSA0: DJB6: etc.

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
NAME

" NAME "

A relation name may consist of up to 42 characters. All letters or numbers are legal characters. However, the first character must be alphabetic.

FEASIL is case sensitive. Filenames written in lower case are different from those written in upper case. For example: relation "TESTFILE" is a different name from "testfile".

Relation names are "hashed" into an 8 character filename. All filenames are 8 characters long, regardless of the length of the relation name. For an explanation of the hashing algorithm, see FEASIL.DOC or the users' manual.

>> PRESS RETURN TO CONTINUE <<

Enter help category or <RETURN> for menu.>  
SORT

" SORT "

The "SORT" option, embedded within Retrieve and Manipulate, is used to organize a relation according to the elements in one column. Sorts are valid for all strategies (integer, decimal, single characters, or character string).

After entering Retrieve and Manipulate, press "S" to enter sort. "Sort" then prompts for the column number on which to sort. If you wish to cancel the sort option enter 0. "Sort" then prompts for an ascending or decending sort. A few seconds after the reply is given, "Sort" provides an estimate of the amount of time needed to complete the sort. Sorts on columns with integer strategy take the least time, while sorts on columns with character string strategy require the most time.

Sorts are not permanent. When the user exits Retrieve and Manipulate the sort is lost. If the user wishes to perserve the sort, the sorted relation must be moved or printed before exiting Retrieve and Manipulate.

>> PRESS RETURN TO CONTINUE <<  
Enter help category or <RETURN> for menu.>  
PLOT

" PLOT "

The "PLOT" option, embedded within Retrieve and Manipulate, is used to display data as an X-Y plot. After entering the plot option, the user must supply which column is to be used as the X-axis variable. This column must have either integer or decimal strategy. The user then selects one or more columns which will be plotted on the Y-axis, versus the X-axis variable. Once all columns to be plotted have been selected, a status report is given on the range of the columns which were selected. The plot menu is then displayed which offers options to 1) quit, 2) reset, 3) report status, 4) set X or Y ranges, 5) plot the data to either the console, printer, or plotter, 6) connect the data points with lines, or 7) add X and Y-axis labels.

>> PRESS RETURN TO CONTINUE <<

APPENDIX M  
Status Option



Appendix M  
Status Option

-----  
Vax Feasil 7.1.4 February 1987  
-----

- 1 = [Q]uit
- 2 = [C]reate a new relation
- 3 = [D]elete a relation
- 4 = [E]dit a relation
- 5 = [MO]dify column specifications
- 6 = [ME]rge two relations
- 7 = [REO]rganize a relation
- 8 = [RET]rieve, manipulate, or plot data
- 9 = [B]ackup a relation to tape
- 10 = [H]elp
- 11 = [S]tatus

Enter selection (Q,C,D,E,MO,ME,REO,RET,B,H,S)  
or corresponding integer 11

-- Status a database --

Name of relation to be statused :SAMPLE

WHAT IS THE NAME OF THE VOLUME YOU ARE USING?  
(default =Current system default volume. )  
Volume name >

Is printer copy desired <YES OR NO> :N  
Is column information desired <YES OR NO> :Y

Relation consist of           572 characters  
Relation has       4 columns and   15 rows.  
Dead to active space % =   0.00

COL	STRATEGY	COLUMN NAME
1	Character string	NAME
2	Integer	STUDENT NUMBER
3	Decimal	SCORE
4	Single character	GRADE

>> PRESS RETURN TO CONTINUE <<

The Dead-To-Active space ratio is an indication of  
how efficiently the relation is stored. If this ratio  
is not zero, use the REORGANIZE command.

## APPENDIX N

Recovering a Relation Name From Hash Name

Appendix N  
Recovering a Relation Name  
From a Hash Name

=>DIR

Directory DUA1:[USERDISK1.TUCKER]

SAMPFGIA.ADF;1            SAMPFGIA.TDF;1            SAMPFGIA.TF;1

Total of 3 files.

The hash name of the relation may be observed with the DIRECTORY command. In this example the hash name is SAMPFGIA. Use the VAX VMS DUMP command to display the contents of SAMPFGIA.TDF to the screen. The name is included in the first "frame". The relation name in this example is SAMPLE.

=>DUMP SAMPFGIA.TDF

Dump of file DUA1:[USERDISK1.TUCKER]SAMPFGIA.TDF;1 on 30-APR-1987  
23:28:58.80

File ID (1919,6,0)    End of file block 11 / Allocated 12

Virtual block number 1 (00000001), 512 (0200) bytes

00000120	00000050	00000038	00000005	....8...P... ..	000000
0000000C	00000016	00000015	0000000F	.....	000010
000000FA	00000000	00000000	00000004	.....z...	000020
00000001	00000001	00000018	00000007	.....	000030
00000005	00000040	00000001	00000001	.....@.....	000040
00000000	000001F5	00000040	000000FA	z...@...u.....	000050
00000000	00000000	00000000	00000000	.....	000060
00000006	00000000	00000000	00000000	.....	000070
00000000	00000000	2020454C	504D4153	SAMPLE .....	000080
00000000	00000000	00000000	00000000	.....	000090
00000000	00000000	00000000	00000000	.....	0000A0
00000000	00000000	00000000	00000000	.....	0000B0
00000000	00000000	00000000	00000000	.....	0000C0

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